

II. CLAIM AMENDMENTS

1 – 45. (Cancelled)

46. (Currently amended) A method of operating an apparatus for suppressing noise in a ~~desired~~-signal accompanied by noise, the method comprising:

- determining, in the apparatus, a first term representing a summation of an estimated periodogram of the ~~desired~~-signal and a predetermined fraction of an estimated periodogram of the accompanying noise;
- determining, in the apparatus, a second term representing a summation of an estimated periodogram of the ~~desired~~-signal plus an estimated power spectral density of the accompanying noise; and
- generating, in the apparatus, a noise reducing filter operative on the basis of a ratio of the first term ~~divided by~~to the second term.

47. (Currently amended) The method according to claim 46, further comprising ~~that~~ determining the first term ~~is~~a summation of an estimated periodogram of the ~~desired~~-signal and a predetermined fraction of an estimated periodogram of the accompanying noise divided by the noise power spectral density.

48. (Currently amended) The method according to claim 46, further comprising ~~that~~choosing a level of the noise included in the estimated periodogram of the ~~desired~~-signal plus ~~the predetermined fraction of an~~the estimated power spectral density ~~periodogram~~ of the accompanying noise ~~is variable~~included in the first term, so as to include a desired amount of noise in a resulting noise suppressed signal.

49. (Currently amended) The method according to claim 48, further comprising ~~that~~ choosing the level of the noise in the estimated periodogram of the ~~desired~~-signal plus ~~the predetermined fraction of an~~the estimated power spectral density ~~periodogram~~ of the accompanying noise included in the first term to provides an acceptable level of context information in a resulting noise suppressed signal.

50. (Currently amended) The method according to claim 46₁ further comprising ~~that choosing the level of the estimated periodogram of the desired signal plus the predetermined fraction of an~~ the estimated power spectral density periodogram of the accompanying noise included in the first term is to be below a mask limit of the speech signal, and ~~is so that the noise~~ not audible to a listener.

51. (Currently amended) A method of operating an apparatus for suppressing noise in a ~~desired~~-signal accompanied by noise, the method comprising:

- determining, in the apparatus, a first term representing a summation of an estimated periodogram of the ~~desired~~-signal and a predetermined fraction of an estimated power spectral density of the accompanying noise;
- determining, in the apparatus, a second term representing a summation of an estimated periodogram of the ~~desired~~-signal plus the estimated power spectral density of the accompanying noise; and
- generating, in the apparatus, a noise reducing filter operative on the basis of a ratio of the first term ~~divided by~~ to the second term.

52. (Currently amended) The method according to claim 51₁ further comprising ~~that determining the first term is as~~ a summation of an estimated periodogram of the ~~desired~~-signal and a predetermined fraction of an estimated ~~periodogram power spectral density~~ of the accompanying noise divided by the noise power spectral density.

53. (Currently amended) The method according to claim 51₁ further comprising ~~that choosing a level of the noise included in the estimated periodogram of the desired and a~~ the predetermined fraction of ~~an~~ the estimated power spectral density of the accompanying noise ~~is variable~~ included in the first term, so as to include a desired amount of noise in a resulting noise suppressed signal.

54. (Currently amended) The method according to claim 53₁ ~~in which the level of the noise in the estimated periodogram of the desired signal and~~ further comprising choosing a the predetermined fraction of ~~an~~ the estimated power spectral density of the

accompanying noise included in the first term to provides an acceptable level of context information in a resulting noise suppressed signal.

55. (Currently amended) The method according to claim 51, further comprising ~~that~~choosing a level of the estimated periodogram of the desired signal and a the predetermined fraction of ~~an~~the estimated power spectral density of the accompanying noise included in the first term is to be below a mask limit of the ~~speech signal, and so that the noise~~ is not audible to a listener.

56. (Currently amended) An apparatus ~~comprising a noise suppressor configured to~~ for suppressing noise in a signal accompanied by noise, the ~~noise suppressor~~apparatus ~~comprising~~configured to:

- ~~a noise estimator configured to~~ determine a first term representing a summation of an estimated periodogram of the ~~desired~~ signal and a predetermined fraction of an estimated periodogram of the accompanying noise;
- ~~a noise estimator configured to~~ determine a second term representing a summation of an estimated periodogram of the ~~desired~~ signal plus an estimated power spectral density of the accompanying noise; and
- ~~a noise reducing filter generator configured to~~ generate a noise reducing filter operative on the basis of a ratio of the first term ~~divided by~~to the second term.

57. (Currently amended) The apparatus of claim 56, wherein the apparatus is further ~~comprising that~~configured to determine the first term ~~is~~as a summation of an estimated periodogram of the ~~desired~~ signal and a predetermined fraction of an estimated periodogram of the accompanying noise divided by the noise power spectral density.

58. (Currently amended) The apparatus according to claim 56, wherein the apparatus is further ~~comprising that~~configured to choose a level of the noise ~~included in the estimated periodogram of the desired signal plus the predetermined fraction of an~~the estimated ~~power spectral density~~periodogram of the accompanying noise ~~is variable~~included in the first term, so as to include a desired amount of noise in a resulting noise suppressed signal.

59. (Currently amended) The apparatus according to claim 58, wherein the apparatus is further comprising that configured to choose the level of the noise in the estimated periodogram of the desired signal plus the predetermined fraction of an the estimated power spectral density periodogram of the accompanying noise included in the first term to provides an acceptable level of context information in a resulting noise suppressed signal.

60. (Currently amended) The apparatus according to claim 56, wherein the apparatus is further comprising that configured to choose the level of the estimated periodogram of the desired signal plus the predetermined fraction of an the estimated power spectral density periodogram of the accompanying noise included in the first term so that it is below a mask limit of the speech signal and is so that the noise is not audible to a listener.

61. (Currently amended) An apparatus ~~comprising a noise suppressor configured to for~~ suppressing noise in a ~~desired~~ signal accompanied by noise, the ~~noise suppressor apparatus comprising configured to:~~

- ~~a noise estimator configured to~~ determine a first term representing a summation of an estimated periodogram of the ~~desired~~ signal and a predetermined fraction of an estimated power spectral density of the accompanying noise;
- ~~a noise estimator configured to~~ determine a second term representing a summation of an estimated periodogram of the ~~desired~~ signal plus the estimated power spectral density of the accompanying noise; and
- ~~a noise reducing filter generator configured to~~ generate a noise reducing filter operative on the basis of a ratio of the first term ~~divided by~~ to the second term.

62. (Currently amended) The apparatus according to claim 61, wherein the apparatus is further comprising that configured to determine the first term is as a summation of an estimated periodogram of the desired signal and a predetermined fraction of an estimated periodogram power spectral density of the accompanying noise divided by the noise power spectral density.

63. (Currently amended) The apparatus according to claim 61, wherein the apparatus is further comprising that configured to choose a level of the noise included in the estimated periodogram of the desired and a the predetermined fraction of an estimated power spectral density of the accompanying noise is variable included in the first term, so as to include a desired amount of noise in a resulting noise suppressed signal.

64. (Currently amended) The apparatus according to claim 63, ~~in which~~wherein the apparatus is further configured to choose the level of the noise in the estimated periodogram of the desired signal and a the predetermined fraction of a the estimated power spectral density of the accompanying noise included in the first term to provides an acceptable level of context information in a resulting noise suppressed signal.

65. (Currently amended) The apparatus according to claim 61, wherein the apparatus is further comprising that configured to choose a level of the estimated periodogram of the desired signal and a the predetermined fraction of an estimated power spectral density of the accompanying noise included in the first term is to be below a mask limit of the speech signal, and so that the noise is not audible to a listener.

66. (New) An apparatus for suppressing noise in a signal accompanied by noise, the apparatus comprising:

- a noise estimator configured to determine a first term representing a summation of an estimated periodogram of the signal and a predetermined fraction of an estimated periodogram of the accompanying noise;
- a noise estimator configured to determine a second term representing a summation of an estimated periodogram of the signal plus an estimated power spectral density of the accompanying noise; and
- a noise reducing filter generator configured to generate a noise reducing filter operative on the basis of a ratio of the first term to the second term.

67. (New) An apparatus for suppressing noise in a signal accompanied by noise, the apparatus comprising:

- means for determining a first term representing a summation of an estimated periodogram of the signal and a predetermined fraction of an estimated periodogram of the accompanying noise;
- means for determining a second term representing a summation of an estimated periodogram of the signal plus an estimated power spectral density of the accompanying noise; and
- means for generating a noise reducing filter operative on the basis of a ratio of the first term to the second term.

68. (New) An apparatus for suppressing noise in a signal accompanied by noise, the apparatus comprising:

- a noise estimator configured to determine a first term representing a summation of an estimated periodogram of the signal and a predetermined fraction of an estimated power spectral density of the accompanying noise;
- a noise estimator configured to determine a second term representing a summation of an estimated periodogram of the signal plus the estimated power spectral density of the accompanying noise; and
- a noise reducing filter generator configured to generate a noise reducing filter operative on the basis of a ratio of the first term to the second term.

69. (New) An apparatus for suppressing noise in a signal accompanied by noise, the apparatus comprising:

- means for determining a first term representing a summation of an estimated periodogram of the signal and a predetermined fraction of an estimated power spectral density of the accompanying noise;
- means for determining a second term representing a summation of an estimated periodogram of the signal plus the estimated power spectral density of the accompanying noise; and
- means for generating a noise reducing filter operative on the basis of a ratio of the first term to the second term.

70. (New) A method of operating an apparatus for suppressing noise in a signal containing noise to provide a noise suppressed signal, the method comprising:

- making, in the apparatus, an estimate of the noise and an estimate of speech together with some but not all of the noise;
- using the estimates in the apparatus to generate a noise reducing filter having a gain coefficient to control the gain of the signal containing noise to suppress the noise,

wherein a first estimation of the gain coefficient is made adaptively in the apparatus and the first estimation is used to produce a noise estimation which is then used in the apparatus to produce a second estimation of the gain coefficient, wherein no use is made of voice activity detection to detect non-speech periods.

71. (New) The method according to claim 70, in which the level of the noise included in the estimate of the speech together with some noise is variable so as to include a desired amount of noise in the noise suppressed signal.

72. (New) The method according to claim 71, in which the level of the noise provides an acceptable level of context information.

73. (New) The method according to claim 70, in which the level of the noise is below a mask limit of the speech and so is not audible to a listener.

74. (New) The method according to claim 70, in which the level of noise approaches the mask limit of the speech and so some noise context information is left in the signal.

75. (New) The method according to claim 70, in which the estimated noise is power spectral density.

76. (New) The method according to claim 70, in which the first estimation is used to update the estimated noise.

77. (New) A noise suppressor for suppressing noise in a signal containing noise to provide a noise suppressed signal, the noise suppressor being configured to:

- make an estimate of noise and an estimate of speech together with some but not all of the noise;
 - use the estimates to generate a noise reducing filter having a gain coefficient to control the gain of the signal containing noise to suppress the noise,
- wherein the apparatus is configured to make a first estimation of the gain coefficient adaptively and to use the first estimation produce a noise estimation which is then used to produce a second estimation of the gain coefficient, wherein no use is made of a voice activity detector to detect non-speech periods.

78. (New) The noise suppressor according to claim 77, in which the level of the noise included in the estimate of the speech together with some noise is variable so as to include a desired amount of noise in the noise suppressed signal.

79. (New) The noise suppressor according to claim 78, in which the level of the noise provides an acceptable level of context information.

80. (New) The noise suppressor according to claim 77, in which the level of the noise is below a mask limit of the speech and so is not audible to a listener.

81. (New) The noise suppressor according to claim 77, in which the level of noise approaches the mask limit of the speech and so some noise context information is left in the signal.

82. (New) The noise suppressor according to claim 77, in which the estimated noise is power spectral density.

83. (New) The noise suppressor according to claim 77, in which the first estimation is used to update the estimated noise.

84. (New) A communications terminal comprising a noise suppressor, the noise suppressor being configured to:

- make an estimate of noise and an estimate of speech together with some but not all of the noise;

- use the estimates to generate a noise reducing filter having a gain coefficient to control the gain of the signal containing noise to suppress the noise, wherein the apparatus is configured to make a first estimation of the gain coefficient adaptively and to use the first estimation produce a noise estimation which is then used to produce a second estimation of the gain coefficient, wherein no use is made of a voice activity detector to detect non-speech periods.

85. (New) A communications network comprising a noise suppressor, the noise suppressor being configured to:

- make an estimate of noise and an estimate of speech together with some but not all of the noise;
- use the estimates to generate a noise reducing filter having a gain coefficient to control the gain of the signal containing noise to suppress the noise,

wherein the apparatus is configured to make a first estimation of the gain coefficient adaptively and to use the first estimation produce a noise estimation which is then used to produce a second estimation of the gain coefficient, wherein no use is made of a voice activity detector to detect non-speech periods.

86. (New) A noise suppressor for suppressing noise in a signal containing noise to provide a noise suppressed signal, the noise suppressor comprising:

- means for estimating noise;
- means for estimating speech together with some but not all of the noise;
- means for using the estimates to generate a noise reducing filter having a gain coefficient to control the gain of the signal containing noise to suppress the noise,

wherein the apparatus is configured to make a first estimation of the gain coefficient adaptively and to use the first estimation produce a noise estimation which is then used to produce a second estimation of the gain coefficient, wherein no use is made of a voice activity detector to detect non-speech periods.